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*The Trusted Integrator for Sustainable Solutions*

REMOVAL SUPPORT TEAM 2
EPA CONTRACT EP-W-06-072

December 15, 2009

Ms. Kimberly Staiger, OSC
U.S. Environmental Protection Agency
Removal Action Branch
2890 Woodbridge Avenue
Edison, NJ 08837

**EPA CONTRACT NO: EP-W-06-072**
**TDD NO: TO-0013-0137**
**DOCUMENT CONTROL NO: RST 2-02-F-1214**
**SUBJECT: FINAL QUALITY ASSURANCE PROJECT PLAN – Jewett White Lead**

Dear Ms. Staiger:

Enclosed please find the final Quality Assurance Project Plan (QAPP) for the Jewett White Lead Site located at 2000 Richmond Terrace, Staten Island, Richmond County, New York.

If you have any questions, please do not hesitate to call me at (732) 585-4437.

Sincerely,

Weston Solutions, Inc.

Gary Boyer, P.E.
Site Project Manager

Enclosure

cc: TDD File No. TO-0013-0137
S. Sumbaly, Chemist QA/QC Specialist

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PREVENTIVE MAINTENANCE PROCEDURES AND SCHEDULES
RECORDS MANAGEMENT SYSTEM
LOGBOOK PROGRAM
QUALITY-RELATED DOCUMENTS
INSPECTION/ACCEPTANCE REQUIREMENTS FOR SUPPLIES AND CONSUMABLES

## LIST OF ATTACHMENTS

# SITE QUALITY ASSURANCE PROJECT PLAN

**Jewett White Lead Site**
**2000 Richmond Terrace, Staten Island, Richmond County, New York**

Prepared by:

Removal Support Team 2
Weston Solutions, Inc.
Federal Programs Division
Edison, New Jersey 08837

Prepared for:

U.S. Environmental Protection Agency
Removal Action Branch
Edison, New Jersey 08837

DCN #: RST 2-02-F-1214
TDD #: TO-0013-0115
EPA Contract No.: EP-W-06-072

**Approved by**:

RST 2

_____ Date: 12/15/09
Gary Boyer
Site Project Manager

RST 2

_____ Date: 12/15/09
Smita Sumbaly, RST 2
Chemist QA/QC Specialist

EPA

_____ Date: 12/15/09
Kimberly Staiger
On-Scene Coordinator

# 1. INTRODUCTION

Presented herein is the Site Quality Assurance Project Plan (QAPP) for the sampling event to be conducted at the Jewett White Lead Site by the Region II Removal Support Team 2 (RST 2). The site QAPP has been developed at the request of the U.S. Environmental Protection Agency (EPA) in accordance with the RST 2 generic QAPP.

This plan is based on information currently available and may be modified on-site in light of field screening results and other acquired information. All deviations from the QAPP will be noted in the Sampling Trip Report.

# 2. PROJECT DESCRIPTION

The Jewett White Lead Site is an approximately one-acre parcel of vacant land (Block 1006, Lot 32) located at 2000 Richmond Terrace, in the Borough of Staten Island, Richmond County, New York. It was formerly used by John Jewett & Sons White Lead Company to manufacture white lead during the period 1839 to 1898. National Lead Industries purchased the business and operated at the location for several decades. A residential neighborhood commences just south of the elevated railroad line and one block west on Port Richmond Avenue. The nearest residence is located approximately 100 feet south of the Site.

The analytical results from an EPA sampling event in December 2008 revealed the presence of elevated levels of lead throughout most of the Site, both laterally and with depth. The average surface lead concentration was 5,081 mg/kg. The highest lead concentration detected at the surface was 37,100 mg/kg, near the gate on Park Avenue. Elevated levels of lead were detected in surface soils and at depth in residential backyards, and in soil samples collected within a six block area surrounding the Site.

RST 2 has been tasked to provide a staff member with an XRF calibrated to detect lead in paint to measure the lead content of exterior portions of residential structures at up to thirteen residential properties in the neighborhood adjoining the Jewett White Lead Site. RST 2 will perform XRF measurements on the exterior portions of the structures.

# 3. PROJECT ORGANIZATION AND RESPONSIBILITIES

The EPA On-Scene Coordinator (OSC), Kimberly Staiger, will provide overall direction to the staff concerning project sampling needs, objectives, and schedule. The Site Project Manager (SPM), Gary Boyer, will be the primary point of contact with the OSC. The SPM is responsible for the development and completion of the Sampling QA/QC Plan, project team organization, and supervision of all project tasks, including reporting and deliverables. The Site QC Coordinator will be responsible for ensuring field adherence to the Sampling QA/QC Plan and recording of any deviations. The RST 2 Chemist QA/QC Specialist, Smita Sumbaly, will be the primary project team site contact with the subcontracted laboratory, if necessary.

The following sampling personnel will work on this project:

| Personnel | Affiliation | Responsibility |
|---|---|---|
| Kimberly Staiger | US EPA | On Scene Coordinator |
| Gary Boyer | RST 2 | Site Project Manager, Field Coordinator, Health & Safety Coordinator, Site QA/QC |
| Smita Sumbaly | RST 2 | QA/QC Specialist |

Laboratory analysis is not required for this sampling event. The XRF field instrument will be used to determine lead in paint from the exterior structure of residences.

# 4. DATA USE OBJECTIVES, QA OBJECTIVES

In addition to the following, the data use objectives, QA objectives procedure will be conducted in accordance with Sections A7, B1, B3, and B4 of the Region II RST 2 QAPP.

The objective of this removal assessment is to confirm the presence or absence of lead in paint on the residential structures. The background information indicates that there are elevated levels of lead in soil in the residential yards. The possibility exists that the lead may be due to lead paint from the residential structures rather than lead from the Jewett White Lead Site. The objective of the sampling event is to determine if lead paint on the structures is a possible source of lead in the soil at the residences. Data from this sampling event will be used to assess potential risk to human health and to the environment.

## 4.1 DATA QA OBJECTIVES

The overall quality assurance (QA) objective for chemical measurement data associated with this sampling event is to provide analytical results that are legally defensible in a court of law. The QA program will incorporate quality control (QC) procedures for field data collection and reporting to ensure generation of sound analytical results.

The EPA On-Scene Coordinator (OSC) has specified a screening data QA objective for the XRF analyses for lead in paint from the structures. Details of this QA level follow.

## 4.2 QA OBJECTIVES

As delineated in the ***Uniform Federal Policy for Quality Assurance Project Plans, Part 2B: Quality Assurance/Quality Control Non-Time Critical QA/QC Activities***, the following requirements apply to the respective QA objectives and parameters identified.

The QA protocols for Screening Data, without confirmation have limited use, specifically for: Emergencies, Health and Safety screening using (e.g. Multi Rae, OVM, Jerome Mercury...etc.). The Field Screening Data objective sampling events are applicable to all sample matrices and include:

1. Sample Documentation (location, date and time collected, batch, etc.)

2. Description of equipment and instrumentation

3. Sample documentation in the form of field logbooks, appropriate field data sheets, and chain-of-custody (when appropriate) records and procedures for field sampling management (e.g., sample location, transport, storage, sample collection methods and shipping procedure)

4. Calibration of all monitoring and/or field-portable analytical equipment prior to collection and analyses of samples with results and/or performance check procedures/methods summarized and documented in a field, personal, and/or instrument log notebook.

5. Analyte(s) identification

6. Field or laboratory determined method detection limits (MDLs) will be recorded along with corresponding analytical sample results, where appropriate.

7. Initial and continuous instrument calibration data.

The objective of this project/event applies to the following parameters:

## Table 1

## Quality Assurance Objectives with Field Portable Analytical Equipment

| QA Parameters | Matrix | Intended Use of Data | QA Objective |
|---|---|---|---|
| Lead | Paint, in situ | Determine presence or absence of lead | Screening data |

A Field Sampling Summary is attached in Table 2 and a QA/QC Analysis and Objectives Summary is attached in Table 3. Subsection 5.1, Sampling Design, provides information on analyses to be performed on the individual samples.

## Table 2

## Field Sampling Summary with Field Portable Analytical Equipment

| Analytical Parameters | Matrix | Container Size | Preservative | Holding Time | Subtotal Samples | Trip Blanks | Rinsate Blanks | Duplicate Samples | MS/MSD Samples | Total Field Samples |
|---|---|---|---|---|---|---|---|---|---|---|
| Lead | Paint, in situ | Not applicable | NR | NR | 39 | NR | NR | NR | NR | 39 |

## Table 3

## QA/QC Analysis and Objectives Summary with Field Portable Analytical Equipment

| Analytical Parameters | Matrix | Analytical Method Reference | QA/QC Quantitation Limits | QA Objective |
|---|---|---|---|---|
| Lead | Paint, in situ | XRF, Instrument Manufacturer, Innov-X, Field Portable Analytical Equipment, see Attachment B | As per method | Screening data |

Note: Samples will not be collected. Field screening results will be measured by XRF field portable analytical equipment and readings will be documented in the field logbook.

# 5. APPROACH AND SAMPLING PROCEDURES

In addition to the following, the approach and sampling procedures will be conducted in accordance with Sections B1 and B4 of the Region II RST 2 QAPP.

The following sampling activities will be conducted at the Jewett White Lead Site:

- XRF lead paint, in situ measurements at residential structures, field portable analytical equipment readings only

This sampling design is based on information currently available and may be modified on-site in light of field-screening results and other acquired information. All deviations from the sampling plan will be noted in the Sampling Trip Report.

## 5.1 SAMPLING DESIGN

A Field Sampling Summary is attached in Table 2 and a QA/QC Analysis and Objectives Summary is attached in Table 3. Table 3 provides information on analyses to be performed on the individual samples. The field program will include the collection of in situ analyses with a field portable XRF from up to 39 locations on thirteen residential properties. The field portable XRF analytical equipment will be standardized and calibrated per the manufacturer's instructions. Each analytical location will be cleaned of loose debris and plastic film will be placed over the paint surface to protect the kapton window of the Innov-X field portable XRF from any damage. The manufacturer's instructions will then be followed to take the XRF reading. Three readings will be taken at each location and the average will be reported.

## 5.2 SCHEDULE OF ACTIVITIES

| Proposed Start Date | Activity | End Date |
|---|---|---|
| December 10, 2009 | In Situ XRF Analysis | December 10, 2009 |
| December 16, 2009 | In Situ XRF Analysis | December 16, 2009 |

## 5.3 SAMPLING EQUIPMENT

The field portable analytical equipment is an Innov-X alpha 2000 XRF for measuring lead in paint in situ. The instrument will be standardized, calibrated and operated per manufacturer's instructions as outlined in Attachment B, Innov-X Manual, Lead-Based Paint.

## 5.4 SAMPLE IDENTIFICATION SYSTEM

Each field analysis by Region II RST 2 will be designated by a code that will identify the site and residence. The code will be a site-specific project tracking number. The code for the Jewett

White Lead Site is JWL. The residence will follow the numeric code. A hyphen will separate the site code and residence. Specific examples are as follows:

58HEB-58 Heberton Ave.
49ANN–49 Ann St.
61PAR-61 Park Ave.
76HEB –76 Heberton Ave.
50HEB-50 Heberton Ave.
55PAR-55 Park Ave.

After the residence, the sequential sample numbers will be listed; sample numbers will be identified as to their location area on the site and/or the location on the x and y coordinates of the sampling grid. For example, JWL-58-HEB-01 would be the first in situ lead paint analysis at 58 Heberton Avenue. A duplicate sample will be identified in the same manner as other samples and will be distinguished and documented in the field logbook.

## 5.5 STANDARD OPERATING PROCEDURES (SOPs)

### 5.5.1 Sample Documentation

All sample documents will be completed legibly, in ink. Any corrections or revisions will be made by lining through the incorrect entry and by initialing the error.

Field Logbook

The field logbook is essentially a descriptive notebook detailing site activities and observations so that an accurate account of field procedures can be reconstructed in the writer's absence. All entries will be dated and signed by the individuals making the entries, and should include (at a minimum) the following:

1. Site name and project number
2. Name(s) of personnel on-site
3. Dates and times of all entries (military time preferred)
4. Descriptions of all site activities, site entry and exit times
5. Noteworthy events and discussions
6. Weather conditions
7. Site observations
8. Sample and sample location identification and description*
9. Subcontractor information and names of on-site personnel
10. Date and time of sample collections, along with chain of custody information
11. Record of photographs
12. Site sketches

* The description of the sample location will be noted in such a manner as to allow the reader to

reproduce the location in the field at a later date.

Sample Labels, Custody Seals, **Section 5.5.2** Sampling SOPs, **Section 5.5.3** Sample Handling and Shipment and **Section 5.6** Sample Containers are not required because actual samples will not be collected for laboratory analysis. Innov-X Alpha 2000 XRF portable field analytical equipment will be used to measure lead in exterior paint in situ. The readings will be documented on site in a field log book.

### 5.7 DISPOSAL OF PPE AND CONTAMINATED SAMPLING MATERIALS

All used PPE and disposable sampling equipment (e.g., plastic film, paper towels) will be disposed of off-site in appropriate trash receptacles. No equipment will be disposed of on-site.

## 6. SAMPLE CUSTODY

**Section 6** Sample Custody is not required because actual samples will not be collected for laboratory analysis. Innov-X Alpha 2000 XRF portable field analytical equipment will be used to measure lead in exterior paint in situ. The readings will be documented on site in a field log book.

## 7. FIELD INSTRUMENT CALIBRATION AND PREVENTIVE MAINTENANCE

In addition to the following, the field instrument and preventative maintenance procedure will be conducted in accordance with Section B5 of the Region II RST 2 QAPP.

The sampling team is responsible for ensuring that a calibration/maintenance log will be brought into the field and maintained for each measuring device. Each log will include at a minimum, where applicable:

- Name of device and/or instrument calibrated.
- Device/instrument serial and/or ID number.
- Frequency of calibration.
- Date of calibration.
- Results of calibration.
- Name of person performing the calibration.
- Identification of the calibrant.

Equipment to be used each day will be calibrated prior to the commencement of daily activities.

## 8. ANALYTICAL METHODS

Field analytical methods to be utilized during this event are detailed in Table 3.

# 9. DATA REDUCTION, VALIDATION, AND REPORTING

In addition to the following, the data reduction, validation, and reporting procedure will be conducted in accordance with Section D1 of the Region II RST 2 QAPP.

## 9.1 DELIVERABLES

The RST 2 SPM, Gary Boyer, will maintain contact with the EPA OSC, Kimberly Staiger, to keep her informed about the technical and financial progress of this project. This communication will commence with the issuance of the work assignment and project scoping meeting. Activities under this project will be reported in status and trip reports and other deliverables (e.g., analytical reports, final reports) described herein. Activities will also be summarized in appropriate format for inclusion in monthly and annual reports.

The following deliverables will be provided under this project:

Trip Report

A trip report will be prepared to provide a detailed accounting of what occurred during each mobilization. The trip report will be prepared within 2 weeks of the last day of each mobilization. Information will be provided on time of major events, dates, and personnel on-site (including affiliations).

Maps/Figures

Maps depicting site layout, contaminant source areas, and sample locations will be included in the trip report, as appropriate.

Analytical Report, Data Review and **Section 9.2** Data Validation are not required because actual samples will not be collected for laboratory analysis. Innov-X Alpha 2000 XRF portable field analytical equipment will be used to measure lead in exterior paint in situ. The readings will be documented on site in a field log book.

# 10. FIELD QUALITY CONTROL CHECKS AND FREQUENCY

In addition to the following, the system audit procedure will be conducted in accordance with Section B6 of the Region II RST 2 QAPP.

Matrix spike/matrix spike duplicate samples and field duplicate samples are not required for screening data.

# 11. SYSTEM AUDITS

In addition to the following, the system audit procedure will be conducted in accordance with Section C1 of the Region II RST 2 QAPP.

The Field QA/QC Officer will observe operations and review subsequent analytical results to ensure compliance with the QA/QC requirements of the project/event.

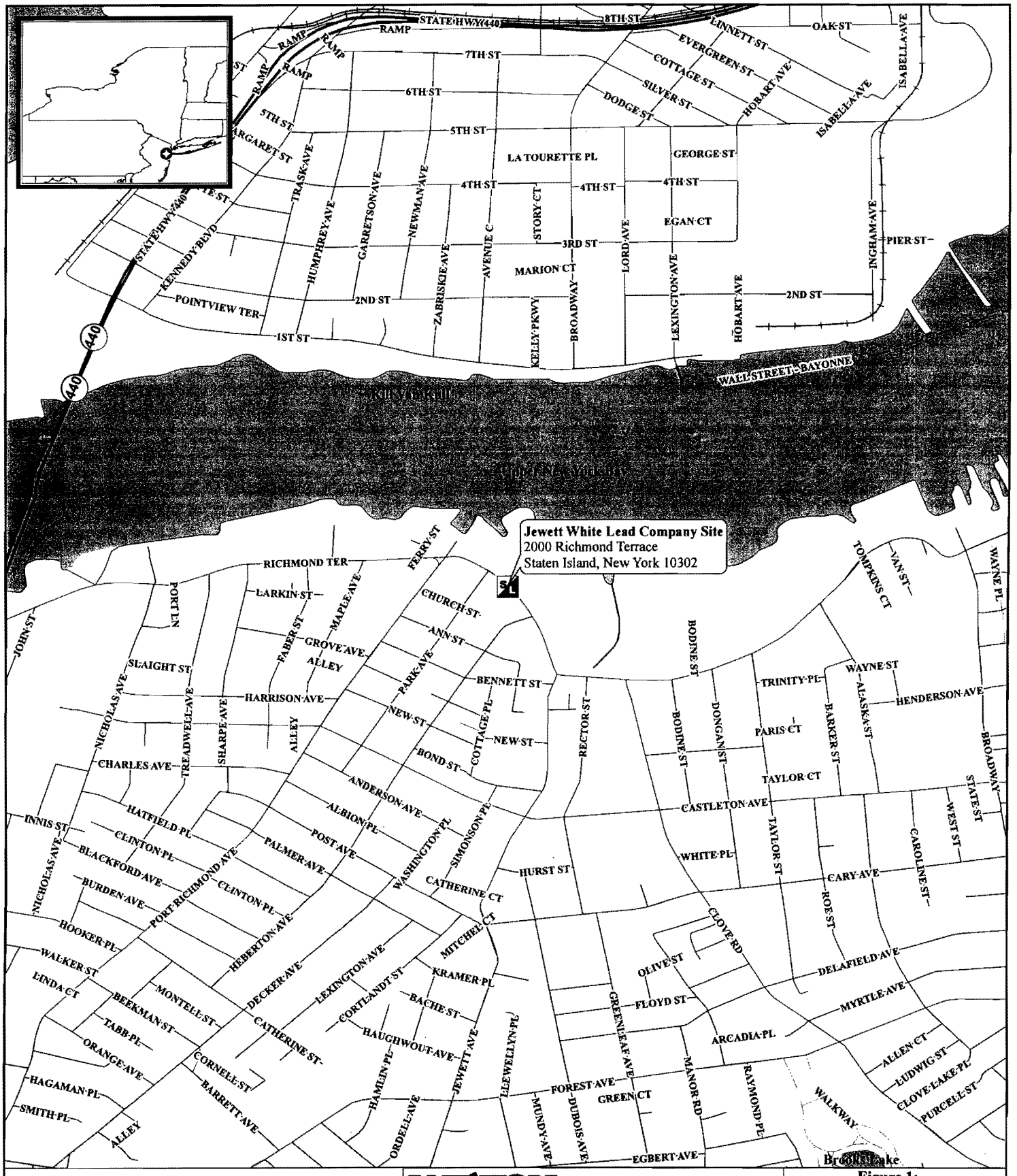
## 12. CORRECTIVE ACTION

In addition to the following, the corrective action procedure will be conducted in accordance with Section C1 of the Region II RST 2 QAPP.

All provisions will be taken in the field to ensure that any problems that may develop will be dealt with as quickly as possible to ensure the continuity of the project. Any deviations from this plan will be noted in the final report.

# ATTACHMENT A

# SITE MAP




## Legend

Site Location

N

0 0.05 0.1 0.2 0.3 0.4 Miles

**Weston Solutions, Inc.**
**Northeast Division**

In Association With
Innovative Technical Solutions, Inc.,
Scientific and Environmental Associates, Inc.
and Avatar Environmental, LLC.

**Figure 1:**
**Site Location Map**

JEWITT WHITE LEAD COMPANY SITE
STATEN ISLAND, NEW YORK

U.S. ENVIRONMENTAL PROTECTION AGENCY
REMOVAL SUPPORT TEAM 2
CONTRACT # EP-W-06-072

| | |
|---|---|
| DATE MODIFIED: 11/24/2008 | |
| GIS ANALYST: | F. CAMPBELL |
| EPA OSC: | K. STAIGER |
| RST SPM: | G. BOYER |
| FILENAME: | SITEMAP.MXD |

# ATTACHMENT B
# INNOV-X MANUAL LEAD-BASED PAINT

# 3.0 Operation

## 3.0 OPERATION - GENERAL

The operation of the INNOV-X XRF Instruments is very simple. Power to the instrument is controlled by the ON/OFF button on the base of the pistol grip. This power button connects the main battery to the electronics, and x-ray power assembly as well as charges the Compaq iPAQ Pocket PC® (iPAQ). The iPAQ operates on the Microsoft Windows CE® operating system and is activated separately by the power button on the right top face, just over the display.

## 3.1 Working with the Compaq iPAQ Pocket PC®

The Microsoft Windows CE® operating system and INNOV-X software provided on the iPAQ handheld computer are operated by user input through the touch screen. Please refer to the iPAQ reference manual for additional details on the operation, specifications and user interface of this powerful computer.

### General tips

- The Start Menu is found in the upper left corner of the iPAQ screen. This is used to launch all applications, including the Innov-X Systems Analyzer software.
- The instrument is designed as a "point and shoot" system that requires little, if any, entry of information for most operations. In the event the user modifies the grade library, enters testing information data, or performs other features, it will be necessary to enter data via the virtual keyboard, which can be accessed by tapping the keyboard icon in the lower right corner. The iPAQ also includes character recognition software. This can be selected from the drop-down menu to the right of the keyboard icon.
- The File toolbar which will be used to Change Functions, Screens and Options is located at the bottom of the screen.
- It is possible to cut, copy, rename and delete files from within Windows File Explorer by selecting the file to be modified and holding the stylus on the screen for 2 seconds.
- Pressing buttons on the bottom of the iPAQ will perform various functions that are described in the iPAQ documentation. The button on the right hand side of the analyzer is the iPAQ task manager. Pressing this button will show all programs that are currently open. Open files can be closed from this menu.
- The upper right corner of the iPAQ will display a circle with **ok** in it, or the symbol ⊗. When the Innov-X software is active, the **ok** will be used to enter data and close screens, while the ⊗ merely minimizes screens.
    - Occasionally, the ⊗ symbol will appear in screens where you enter data. If this happens, tapping anywhere in the screen will bring up the **ok** button.
    - If you wish to exit the Innov-X software, select ***File*** → ***Exit***, rather than tapping the ⊗ button. You may need to close three screens to completely exit the software.

### Changing the Display Font Size

1. Tap the Upper Left Corner for the Start Menu.
2. Select Internet Explorer.
3. Select ***View*** →***Text Size***.
4. Select the desired size.

## 3.2 OPERATION - MAIN SOFTWARE SCREENS

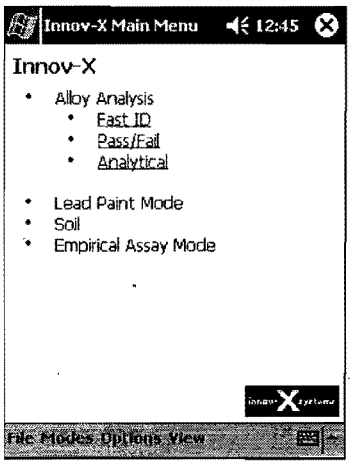
The Innov-X Software consists of three main screens:

- **Main Menu screen:** Used to select the analysis mode, access old testing results, etc.
- **Analysis Screen:** Used to change settings, edit libraries, setup sorting methods, etc.
- **Results Screen:** Displays results from current reading, allows scrolling back to previous test results.

### 3.2.1 Innov-X Main Menu

The main menu below appears upon startup. The Main Menu allows you to choose an analysis mode, as well as perform certain administrative functions such as changing your login password. The modes which are available on the analyzer are shown in blue. Innov-X software can be upgraded at any time, often via the internet. Please contact the Innov-X Sales Department at 866-446-6689 for upgrade information.

- **Use the Main Menu to select the desired analysis mode.** The analysis mode can be selected by either tapping on the name of the method (shown in blue) or by selecting the appropriate mode from the Modes menu.
- The administrative password can be changed by selecting ***Options → Change Password.***
- It is possible to go directly to the Results Screen by selecting ***View→Results.*** If the results screen is opened in this manner, it is possible to view results when the iPAQ is not connected to the analyzer.



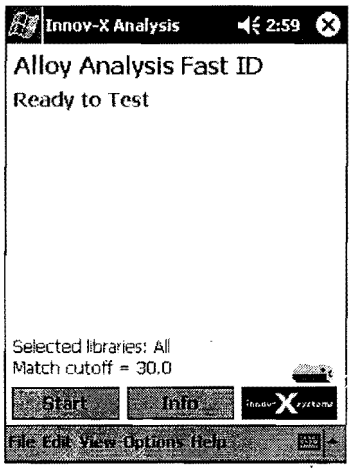

### 3.2.2 The Analysis Screen

Selecting a mode opens up the analysis window for that mode. All of the data acquisition and analyzer control is done from this window. This window allows the user to start or stop an analysis, change testing parameters, and modify the fingerprint and grade libraries.

The analysis screen can be selected from the Main menu, once it is open, it runs continually while the software is active. From the results menu, it is always possible to go back to the Analysis screen by selecting *File → Exit.*

The analysis screen for FastID is shown below. Screens from other modes are very similar and will be described in further detail later in this manual. The analysis screen shows the name of the mode that is currently active, a start/stop button for starting and stopping tests, an info button that is used to enter test specific information, and a battery indicator. In addition, a message appears directly below the name of the mode which will indicate the current state of the analyzer. Typically it will say "Ready to Test" but it will

provide other information in certain circumstances. The information displayed on the bottom of the screen, directly above the Start button provides additional information about analyzer settings and will be described later in the manual.




### 3.2.3 The Results Screen

The Results Screen displays the current reading and old data. All data handling functions such as exporting and deleting readings are carried out from this screen. Once the Results Screen is open, the user may start new tests without going back to the analysis screen.

The results screen is automatically shown at the completion of any analysis. It can also be accessed from the analysis screen for any mode or the **Main Menu**, by selecting ***View → Results***.

In the default mode, the Results screen displays the Grade ID for **FastID** and **Analytical Modes**, and Pass/Fail Results for **Pass/Fail Mode**. The information which is displayed can be changed by selecting the **View** menu. It is possible to show just the Grade Id, the Grade ID and Chemistry, or the spectra for a reading. In addition, it is possible to view Test Information and a Pass/Fail log.

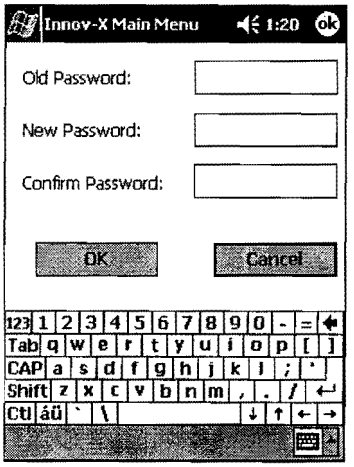
## 3.3 PASSWORDS - ABOUT PASSWORD PROTECTION

Certain functions such as adding and deleting fingerprints from the libraries, and Pass/Fail setup have been specified as Administrative Level Functions. These functions are described in detail in later sections of the manual. In order to use these functions, a password must be entered. The default password is set as the letter "Z". This password can be entered whenever the system prompts you for a password.

In addition, some features such as Calibration and Elemental Regions are protected with a factory password. These features can only be modified by a factory authorized technician.

## Changing the Administrative Password.

The security password may be changed at any time from the **Innov-X Main Menu** by choosing ***Option s → Change Password***. When the change password option is selected, this screen will appear.



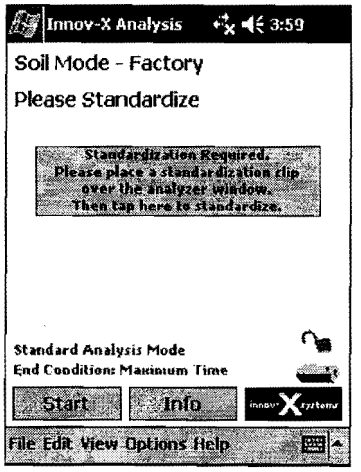

If you are changing the password for the first time, enter the letter "Z"; otherwise enter the current system password. Then, choose a password and enter it twice, once in the "New Password Box" and again in the "Confirm Password" box. Passwords may be any combination of letters or numbers. Any password should be something that can be easily remembered but is difficult for someone else to figure out.

# 3.4 STANDARDIZATION

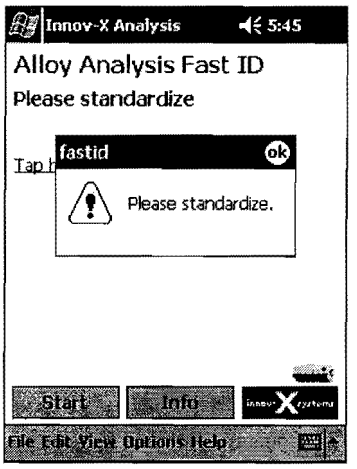
In order to verify that your analyzer is working correctly, it is necessary to periodically standardize the instrument. This automated procedure involves collecting a spectrum and comparing a variety of parameters to values stored when the instrument was calibrated at the factory. If there are any problems with the instrument, they will be indicated by an error message.

The standardization procedure takes about 1 minute. Standardization must be done any time the analyzer hardware is restarted and must be repeated if the instrument is operating for more than 4 (four) hours. It is possible to re-standardize the instrument at any point while the software is running. Standardization is always initiated from the Analysis Screen of any Mode.

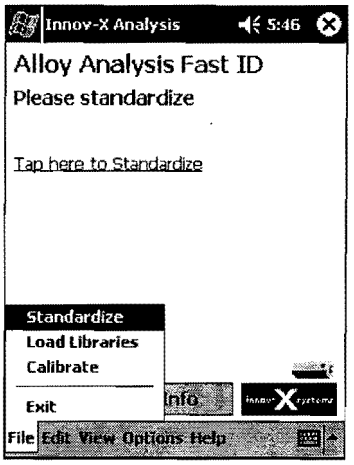
If the analyzer is restarted, you will be required to standardize the instrument before performing any measurements. This is indicated by the message **Please standardize** on the analysis screen



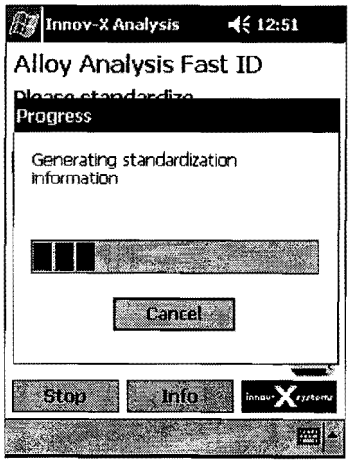
It is not possible to start a test before standardization. If Start is pressed, or the trigger is pulled before the standardization procedure is completed, a message box will appear. Press **ok** to dismiss the message.




To initiate the standardization procedure, click the standardization piece on the front of the instrument. Verify that the solid portion of the piece completely covers the analysis window. Tap the words **Tap here to Standardize** or selected ***File → Standardize.***

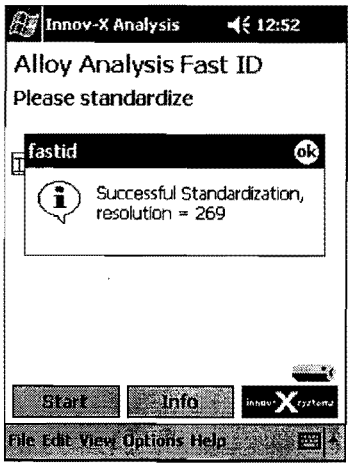



When standardization is in progress, the red light on the top of the instrument will blink indicating that the X-ray tube is energized and the shutter is open. In addition, the amber light on the back of the instrument will be illuminated, and a status bar will appear tracking the progress of the measurement.



When standardization is complete, the message "Successful standardization" will appear, along with the resolution of the instrument. Tap **ok** to dismiss the message and the instrument is ready for testing.

It is good practice to keep a log of the standardization values for your instrument. A large change in resolution (>50) may indicate a hardware problem with the unit.



**Standardization Errors**

The analyzer is designed with several diagnostic checks during the standardization process. If the standardization fails, the instrument will prompt the user regarding the next step. Generally the next step is to simply repeat the standardization.

Several errors could occur while standardizing:

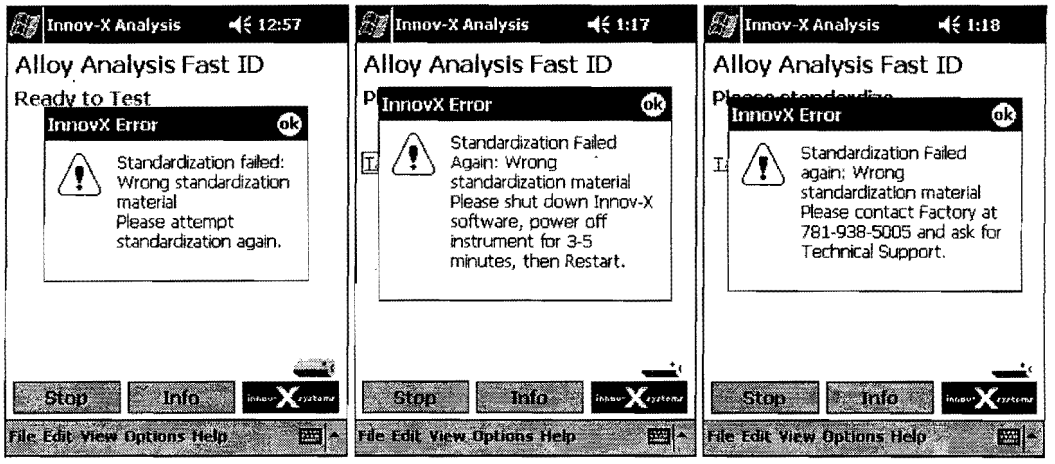
1. "Wrong Standardization Material."
2. "Resolution too High"
3. "Error in Count Rate"

Take note of any error messages, as it may be necessary to relay this information to a Technical Support Engineer.

When standardization fails, verify that the standardization mask is in place and attempt standardization again. To restandardize after a failure, tap the "Tap Here to Standardize" icon on the display, or choose ***File → Standardize***. Make sure that the solid part of the standardization mask is covering the window rather than the side with the welding collimator.

If standardization fails again, exit that software and power off the instrument. Restart and restandardize. Try replacing the battery after a second failure. Occasionally a weak battery can cause a standardization failure. Sometimes a battery may be completely charged, but still cause problems with standardization. In this case, removing and replacing the battery will fix the problem.

If the standardization fails after several attempts, contact the Innov-X Systems Service center at **866-446-6689.**



# Lead Paint Analysis

## 4.0 Lead Paint ANALYSIS

Two modes exist for lead based paint (LBP) analysis:

- **Inspection Mode,**
- **Fixed Time Mode**

**Inspection Mode**

Inspection Mode automatically ends the test when the analyzer reaches a Positive or Negative determination with 95% confidence. Inspection Mode is the mode tested for the Innov-X Performance Characteristic Sheet (PCS) and is therefore the recommended testing mode for residential lead paint inspections or those done for Title X compliance. Inspection Mode is a variable time mode. It is designed to arrive at a Positive or Negative determination as fast as possible but still meet the 95% confidence requirements of the PCS. The further the lead paint level is from the action level (default action level is 1.0 mg/cm2), generally the faster the test.

**Fixed Time Mode**

Fixed Time mode always tests up to the test time set by the user (default is 15 seconds). Fixed Time mode is typically used when operators want to get high precision lead measurements, as opposed to rapid testing versus the 1.0 mg/cm2 action level. Examples of when operators use Fixed Time mode is for renovation, elevated blood-lead (EBL) investigations or OSHA compliance. In these cases, operators often want to measure any detectable lead, as opposed to lead near the 1.0 mg/cm2 Federal standard.

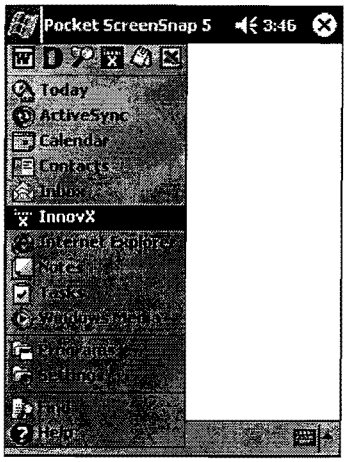
## 4.1 STARTING THE INSTRUMENT AND TAKING A MEASUREMENT

The basic startup and testing procedure is described below. All screen shots were taken using a different testing mode, however, the basic procedure is the same for all three alloy modes.

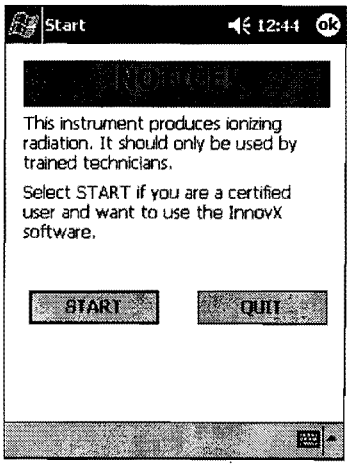
### 4.1.1 BASIC OPERATION

1. Install a freshly charged battery in the instrument.
2. Turn on the analyzer by pressing the power switch located on the base of the instrument.
3. Verify that the iPAQ is correctly seated on the top of the unit. If the iPAQ is properly connected, the amber light on the upper right side of the iPAQ next to the power button will blink, indicating that the iPAQ is receiving charge from the analyzer.
4. If the iPAQ is not on, turn it on by pressing the power button on the upper right side of the iPAQ.

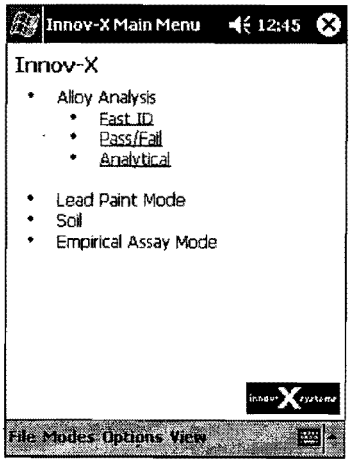
5. Start the Innov-X Systems Software by selecting the Start Menu from the upper left hand corner of the iPAQ screen. Select the Innov-X Systems Software from the drop down menu.



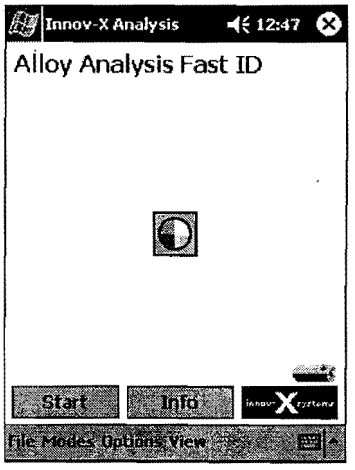

6. A notice will appear reminding the user that this instrument produces ionizing radiation and requires a trained user. Select **START** to start the Innov-X Systems Software package. . Selecting **QUIT** will exit the Innov-X Software.



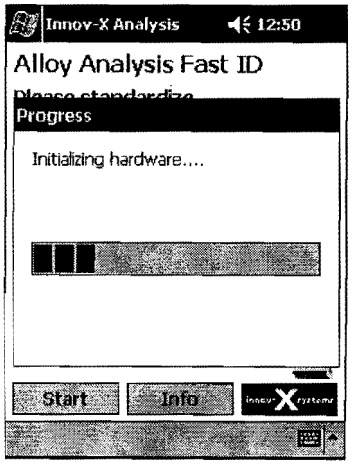

7. The Main Menu will open. Tap the name of the Mode you will be using to open that mode. Select **Lead Paint Mode.**



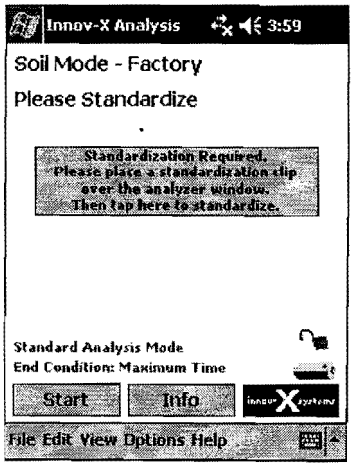
8. There may be a brief pause while the instrument loads the various parameters needed for operation. While this occurs, an icon will appear in the center of the iPAQ screen.



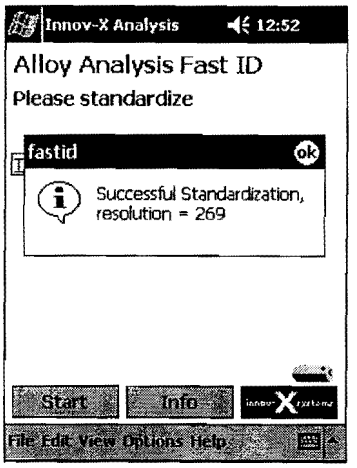

9. Once the measurement mode has been selected, the instrument will go through a 1 minute hardware initiation during which the electronics will stabilize and the detector cooling will be initialized. This is indicated by a progress bar.



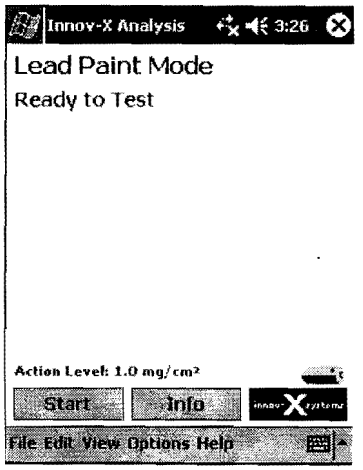

10. The message **Please Standardize** will appear. It will not be possible to analyze a sample without a successful standardization. Place the standardization jig in front of the analyzer window. Tap the blue words **Tap here to Standardize**. The analyzer will take approximately 1 minute; a status bar will be displayed throughout the measurement. Standardization is described in more detail in section 4.4.



11. When standardization is complete, the resolution of the analyzer will be displayed. Tap **ok** to dismiss this screen.

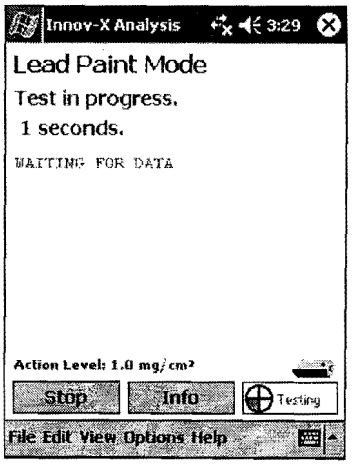



12. The analyzer is now ready to take a measurement. Note that the pre-set action level is displayed at the bottom of the testing screen. The lead test may be started by pulling the trigger or by tapping the START icon on the screen. Most operators use the trigger operation.



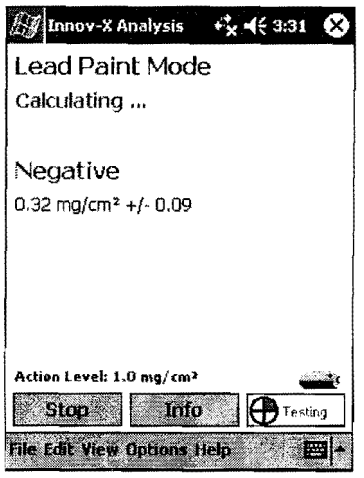

13. Hold the analyzer up to the sample to be analyzed. Make sure the sample is as flush against the analyzing window as is possible. You may start an analysis either by pulling the trigger or by selecting start from the iPAQ screen. **Note: You do not need to hold the trigger. A single pull on the trigger starts a test. Another pull on the trigger aborts the test.**

    a. After an analysis is started, the message "Test in Progress." will appear, followed by the number of seconds elapsed during the measurement. For the duration of the test, the red light on top of the instrument will blink, and the "testing" icon will appear in the lower right corner of the iPAQ.

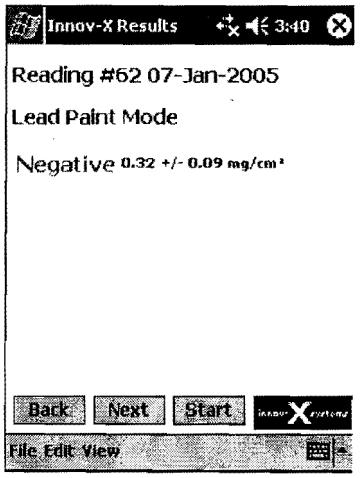



Note: Some state regulations require a "deadman" trigger meaning that the trigger must be held in to keep the x-ray tube enabled. The deadman trigger may be engaged via a software menu, please contact Innov-X technical support at 1-781-938-5005 for instructions.

b. When the calculations are complete, there will be a slight delay the first time the results screen is opened any time the software is restarted. An icon will appear in the center of the screen. This indicates that the results program is loading and re-indexing all saved results.




14. The results screen will display the results. The information displayed on the results screen may be changed by selecting one of the options under the View menu. This is described later in this chapter under the Results section.



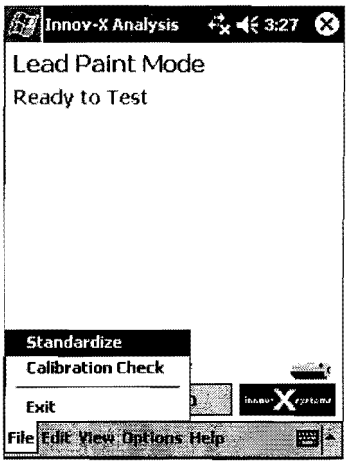

15. Once the results screen is open, subsequent readings may be taken either by selecting start from the iPAQ screen, or by pulling the trigger. If at any point, you wish to return to the analysis screen, select ***File →Exit.***

After the startup procedure is complete, and the analyzer is standardized, you are ready to analyze unknown samples. For first time use, follow these 2 simple steps to familiarize yourself with the analyzer, and ensure that settings are correct.

## 4.1.2 Checking Calibration:

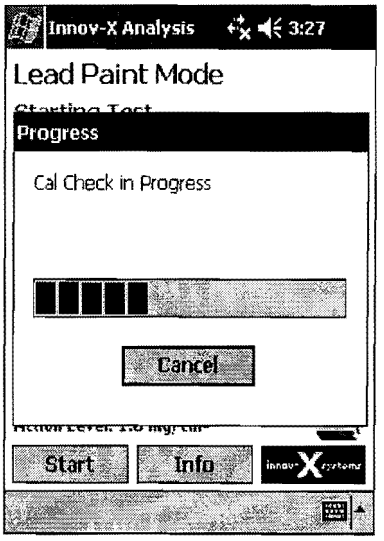
Innov-X recommends checking the analyzer calibration every 4 hours. The analyzer is very stable and it is very unlikely that the user encounters drift in calibration, it is common quality control practice to regularly verify calibration.

1. In order to check the analyzer calibration, get to the Ready to Test screen. From this screen (shown below) tap "Calibration Check."

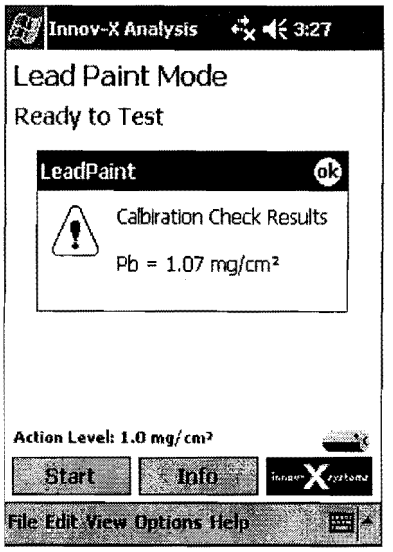



2. Place the analyzer onto the calibration block provided, and tap the OK icon on the display. The calibration block is a NIST 2573 SRM of 1.04 mg/cm2 of lead paint.


3. The analyzer will proceed to take a 30 second test of the calibration block. A progress bar will appear on the display to indicate the testing status.



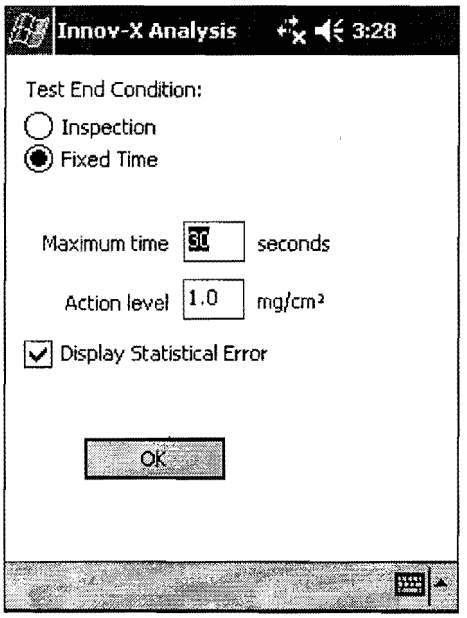
4. At the conclusion of the test, the analyzer will display the result. The Innov-X PCS states that a result between 0.85 and 1.2 mg/cm2 is within calibration. If the result is outside of this calibration range, repeat the calibration check. If the 2nd calibration check is within the range, continue testing. If the 2nd calibration check is outside the range, contact Innov-X technical support at 781-938-5005.




## 4.1.3 Setting the Action Level:

The action level defaults to the Federal standard of 1.0 mg/cm2. All lead paint testing for HUD or Title X compliance should be performed with the action level set to this value. Exceptions are State, County or City regulations where lower action levels are utilized, for example 0.7 mg/cm2.

To set the action level first get to the Ready to Test screen. The top of the display will either say Ready to Test or Results. If it says Results, then select ***File→ Exit*** from the bottom left menu item on the display.



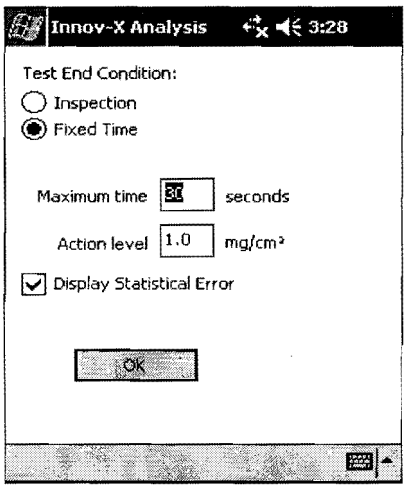
From the Ready to Test screen, select Options -> Setup. The following menu appears as shown above. Highlight the box next to Action Level, tap on the keyboard icon (lower right of screen display). A keyboard will appear. Enter 1.0 for the action level, or whatever value is required, and tap OK.

## 4.1.4 Setting the Testing Mode:

There are two testing modes: Inspection and Fixed Time. Lead paint inspections for compliance with the Innov-X PCS must be done in Inspection Mode.

To place the analyzer into Inspection Mode, get to the Ready to Test screen.

Choose Options -> Setup to bring up the standard setup screen:




Tap on the circle next to Inspection Mode or Fixed Time Mode, depending on the desired testing, and choose OK.

**Display Statistical Error:**

The operator may also tap on the "Display Statistical Error" on the setup screen. This option will enable the test precision (+/- value) to be displayed.

**Maximum Time:**

Maximum Time serves two purposes. In Fixed Time mode, it is the actual testing time used by the analyzer. When an operator begins a test, the analyzer tests until the elapsed time reaches the maximum testing time, then the analyzer automatically terminates the test.

In Inspection Mode, the Maximum Time is also the maximum test time allowed for the analyzer to reach a Positive or Negative determination. In general, in Inspection Mode, the analyzer will make a Positive or Negative decision very quickly – in 2-3 seconds. In some cases, if the lead paint level is very close to the

action level, the analyzer will have to test longer, to achieve a higher precision (lower +/- value) in order to make a decision. The Maximum Test time is the longest test allowed in Inspection Mode. If the elapsed time reaches the maximum, the software forces a Positive or Negative decision.

# Performance Characteristic Sheet

**EFFECTIVE DATE:** **December 1, 2006** **EDITION NO.: 1**

**MANUFACTURER AND MODEL:**

Make: ***Innov-X Systems, Inc.***
Models: ***LBP4000 with software version 1.4 and higher***
Source: ***X-ray tube***

## FIELD OPERATION GUIDANCE

**OPERATING PARAMETERS:**

Inspection mode, variable reading time.

**XRF CALIBRATION CHECK LIMITS:**

| |
|---|
| 1.0 to 1.1 mg/cm$^2$ (inclusive) |

**SUBSTRATE CORRECTION:**

Not applicable

**INCONCLUSIVE RANGE OR THRESHOLD:**

| INSPECTION MODE<br>READING DESCRIPTION | SUBSTRATE | INCONCLUSIVE RANGE (mg/cm$^2$) |
|---|---|---|
| Results not corrected for substrate bias on any substrate | Brick | 0.6 to 1.1 |
| | Concrete | 0.6 to 1.1 |
| | Drywall | 0.6 to 1.1 |
| | Metal | 0.6 to 1.1 |
| | Plaster | 0.6 to 1.1 |
| | Wood | 0.6 to 1.1 |

## BACKGROUND INFORMATION

**EVALUATION DATA SOURCE AND DATE:**

This sheet is supplemental information to be used in conjunction with Chapter 7 of the HUD *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing* ("HUD Guidelines"). Performance parameters shown on this sheet are calculated from the EPA/HUD evaluation using archived building components. Testing was conducted on 146 test locations, with two separate instruments, in December 2005.

**OPERATING PARAMETERS:**

Performance parameters shown in this sheet are applicable only when properly operating the instrument using the manufacturer's instructions and procedures described in Chapter 7 of the HUD Guidelines.

**XRF CALIBRATION CHECK:**

The calibration of the XRF instrument should be checked using the paint film nearest 1.0 mg/cm$^2$ in the NIST Standard Reference Material (SRM) used (e.g., for NIST SRM 2579, use the 1.02 mg/cm$^2$ film).

If the average (rounded to 1 decimal place) of three readings is outside the acceptable calibration check range, follow the manufacturer's instructions to bring the instrument into control before XRF testing proceeds.

**SUBSTRATE CORRECTION VALUE COMPUTATION:**

Chapter 7 of the HUD Guidelines provides guidance on correcting XRF results for substrate bias. Supplemental guidance for using the paint film nearest 1.0 mg/cm$^2$ for substrate correction is provided:

XRF results are corrected for substrate bias by subtracting from each XRF result a correction value determined separately in each house for single-family housing or in each development for multifamily housing, for each substrate. The correction value is an average of XRF readings taken over the NIST SRM paint film nearest to 1.0 mg/cm$^2$ at test locations that have been scraped bare of their paint covering. Compute the correction values as follows:

Using the same XRF instrument, take three readings on a bare substrate area covered with the NIST SRM paint film nearest 1 mg/cm$^2$. Repeat this procedure by taking three more readings on a second bare substrate area of the same substrate covered with the NIST SRM.

Compute the correction value for each substrate type where XRF readings indicate substrate correction is needed by computing the average of all six readings as shown below.

For each substrate type (the 1.02 mg/cm$^2$ NIST SRM is shown in this example; use the actual lead loading of the NIST SRM used for substrate correction):

Correction value = (1st + 2nd + 3rd + 4th + 5th + 6th *Reading*) / 6 - 1.02 mg/cm$^2$

Repeat this procedure for each substrate requiring substrate correction in the house or housing development.

**EVALUATING THE QUALITY OF XRF TESTING:**

Randomly select ten testing combinations for retesting from each house or from two randomly selected units in multifamily housing.

Conduct XRF re-testing at the ten testing combinations selected for retesting.

Determine if the XRF testing in the units or house passed or failed the test by applying the steps below.

Compute the Retest Tolerance Limit by the following steps:

Determine XRF results for the original and retest XRF readings. Do not correct the original or retest results for substrate bias. In single-family and multi-family housing, a result is defined as a single reading. Therefore, there will be ten original and ten retest XRF results for each house or for the two selected units.

Calculate the average of the original XRF result and the retest XRF result for each testing combination.

Square the average for each testing combination.

Add the ten squared averages together. Call this quantity C.

Multiply the number C by 0.0072. Call this quantity D.

Add the number 0.032 to D. Call this quantity E.

Take the square root of E. Call this quantity F.

Multiply F by 1.645. The result is the Retest Tolerance Limit.

Compute the average of all ten original XRF readings.

Compute the average of all ten re-test XRF readings.

Find the absolute difference of the two averages.

If the difference is less than the Retest Tolerance Limit, the inspection has passed the retest. If the difference of the overall averages equals or exceeds the Retest Tolerance Limit, this procedure should be repeated with ten new testing combinations. If the difference of the overall averages is equal to or greater than the Retest Tolerance Limit a second time, then the inspection should be considered deficient.

Use of this procedure is estimated to produce a spurious result approximately 1% of the time. That is, results of this procedure will call for further examination when no examination is warranted in approximately 1 out of 100 dwelling units tested.

**TESTING TIMES:**

For the variable-time inspection paint test mode, the instrument continues to read until it has determined whether the result is positive or negative (with respect to the 1.0 mg/cm$^2$ Federal standard), with 95% confidence. The following table provides testing time information for this testing mode.

| Testing Times Using Variable Reading Time Inspection Mode (Seconds) | | | | | | |
|---|---|---|---|---|---|---|
| | All Data | | | Median for laboratory-measured lead levels (mg/cm$^2$) | | |
| Substrate | 25$^{th}$ Percentile | Median | 75$^{th}$ Percentile | Pb < 0.25 | 0.25 ≤ Pb < 1.0 | 1.0 ≤ Pb |
| Wood, Drywall | 2.1 | 2.3 | 5.4 | 2.2 | 5.4 | 2.2 |
| Metal | 2.6 | 3.2 | 5.3 | 2.7 | 5.1 | 5.1 |
| Brick, Concrete, Plaster | 3.1 | 4.0 | 5.7 | 3.2 | 4.0 | 5.9 |

**CLASSIFICATION OF RESULTS:**

When an inconclusive range is specified on the *Performance Characteristic Sheet*, XRF results are classified as positive if they are greater than the upper boundary of the inconclusive range, negative if they are less than the lower boundary of the inconclusive range, or inconclusive if in between. The inconclusive range includes both its upper and lower bounds. If the instrument reads "> x mg/cm$^2$", the value "x" should be used for classification purposes, ignoring the ">". For example, a reading reported as ">1.0 mg/cm$^2$" is classified as 1.0 mg/cm$^2$, or inconclusive. When the inconclusive range reported in this PCS is used to classify the readings obtained in the EPA/HUD evaluation, the following False Positive, False Negative and Inconclusive rates are obtained:

FALSE POSITIVE RATE: 2.5% (2/80)

FALSE NEGATIVE RATE: 1.9% (4/212)

INCONCLUSIVE RATE: 16.4% (48/212)

**DOCUMENTATION:**

A document titled *Methodology for XRF Performance Characteristic Sheets* provides an explanation of the statistical methodology used to construct the data in the sheets, and provides empirical results from using the recommended inconclusive ranges or thresholds for specific XRF instruments. For a copy of this document call the National Lead Information Center Clearinghouse at 1-800-424-LEAD.

This XRF Performance Characteristic Sheet was developed by the Midwest Research Institute (MRI) and QuanTech, Inc., under a contract between MRI and the XRF manufacturer. XRF Performance Characteristic Sheets were originally developed by the MRI under a grant from the U. S. Environmental Protection Agency and the U.S. Department of Housing and Urban Development. HUD has determined that the information provided here is acceptable when used as guidance in conjunction with Chapter 7, Lead-Based Paint Inspection, of HUD's *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing*.